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Frustration-induced diffuse magnetic scattering in metallic HoInCu4

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Materials with magnetically frustrated interaction often host unconventional phases of matter, such as multiferroics, (quantum) spin liquid and exotic magnetic phases. However, most research on frustrated materials have been performed on insulating spin systems, but only little work has been done on metallic systems.

In metallic HoInCu4, frustration stems from the cubic face-centered arrangement of the rare-earth ions, likely leading to a magnetic ground state with partial magnetic order where only half of the Holmium moments exhibit long-range magnetic order, the other half remaining short-range correlated [1]. Here, we use neutron scattering to elucidate the microscopic mechanism leading to this intriguing ground state. Notably, we will show diffuse magnetic scattering results of HoInCu4 as function of temperature and external magnetic field. We will discuss how the diffuse signal can be attributed to magnetic nearest and next-nearest neighbor interactions, and compare the measured magnetic excitations to the predicted model calculations.

[1] O. Stockert et al., Phys. Rev. Research 2, 013183 (2020).